MFOQA

Military Flight Operations Quality Assurance & Applications to Maintenance

Presented to:

2005 Naval Safety Center Aviation Safety Maintenance Conference

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Quadelta, Inc.
On behalf of:
Deputy Assistant Secretary of the Navy for Safety

DON MFOQA

A knowledge management process with the capability to use

downloaded flight data

After Every Flight

to provide the operator with

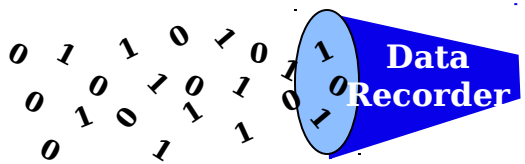
quantitative information

regarding aircrew and aircraft performance

to improve operational readiness,

training, maintenance and safety

MFOQA



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Visual Learning Animated Debrief & Automated Analysis

INFORMATION

Squadro

Operations

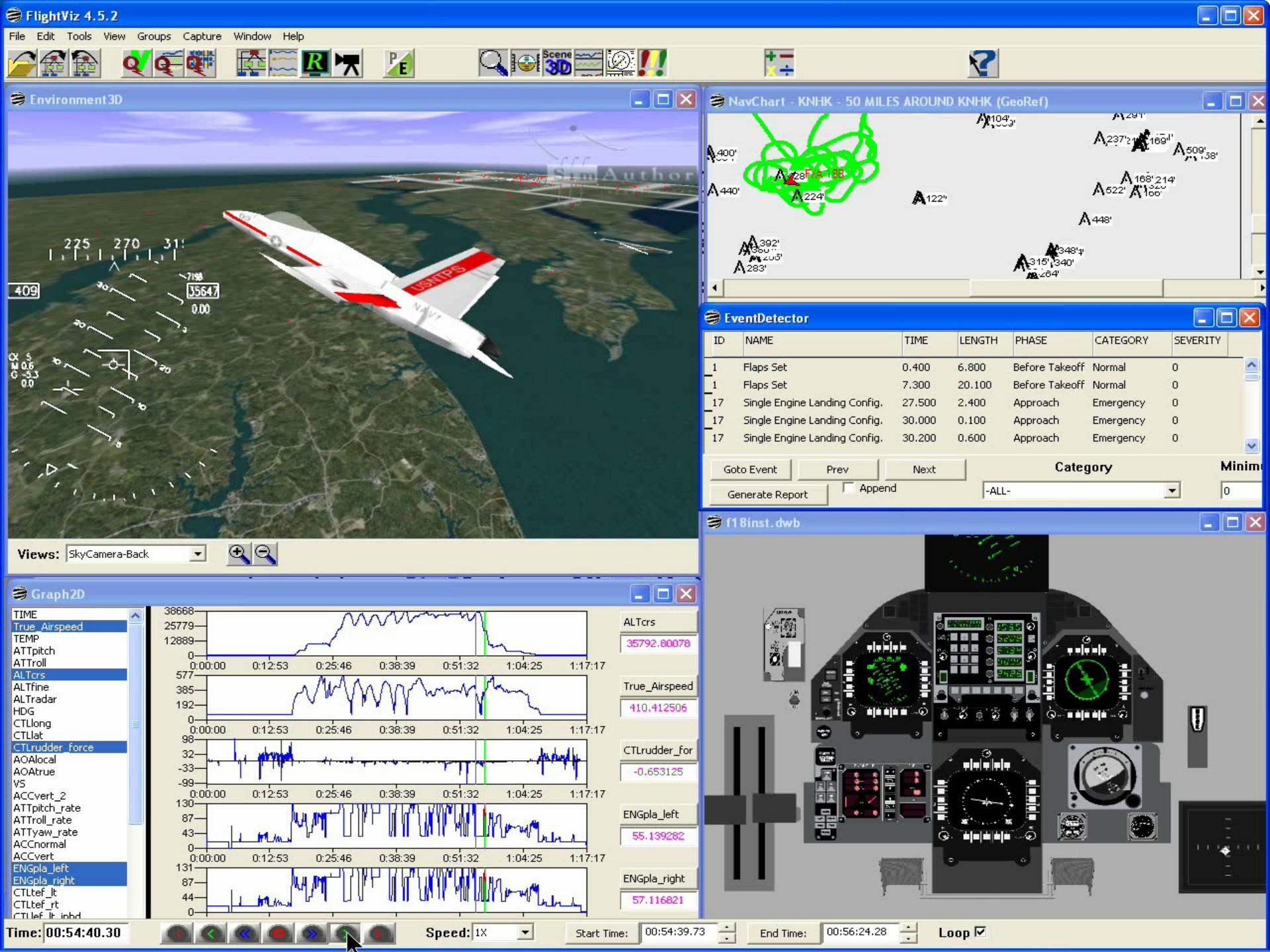
Training

Maintenance

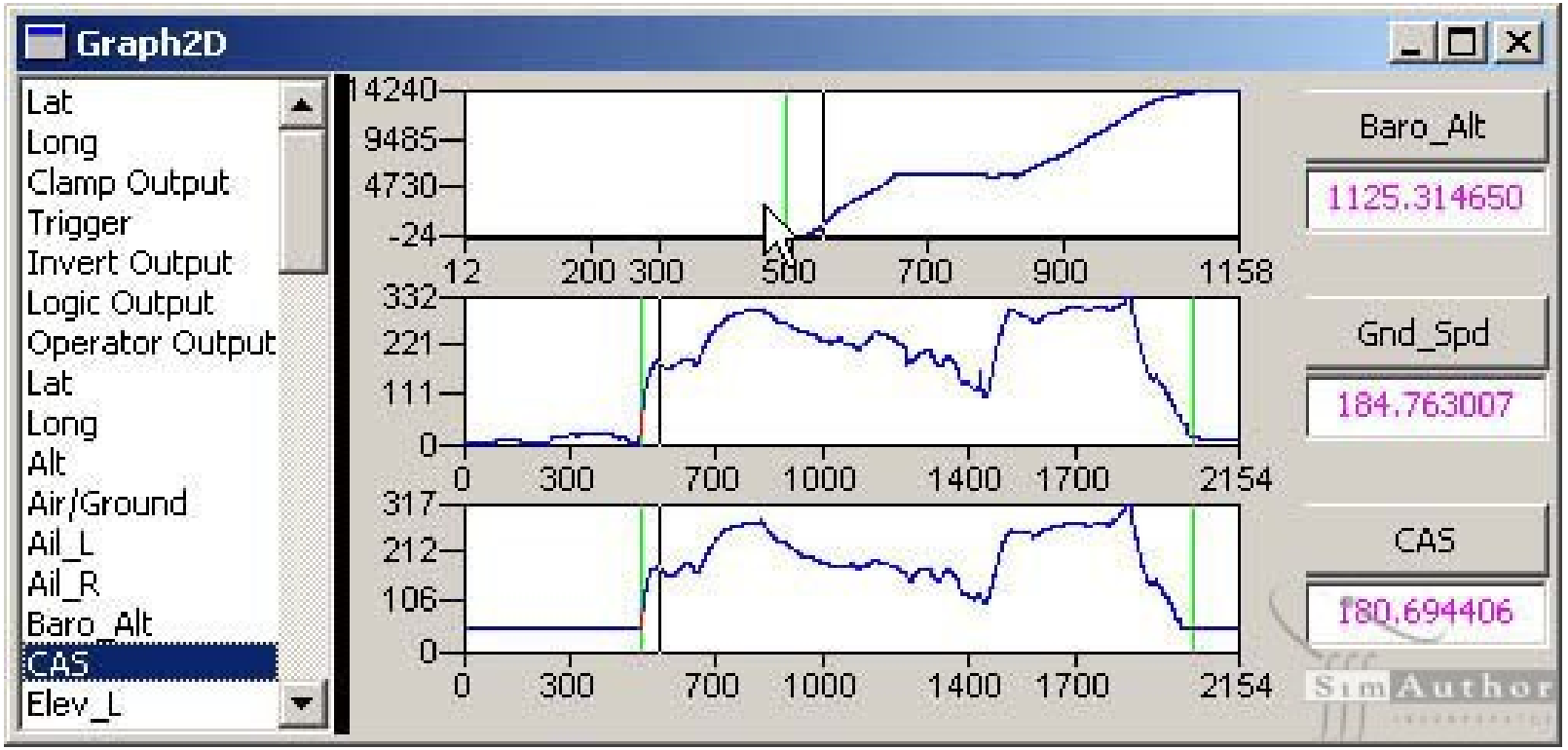
Safety

Fleet Repository

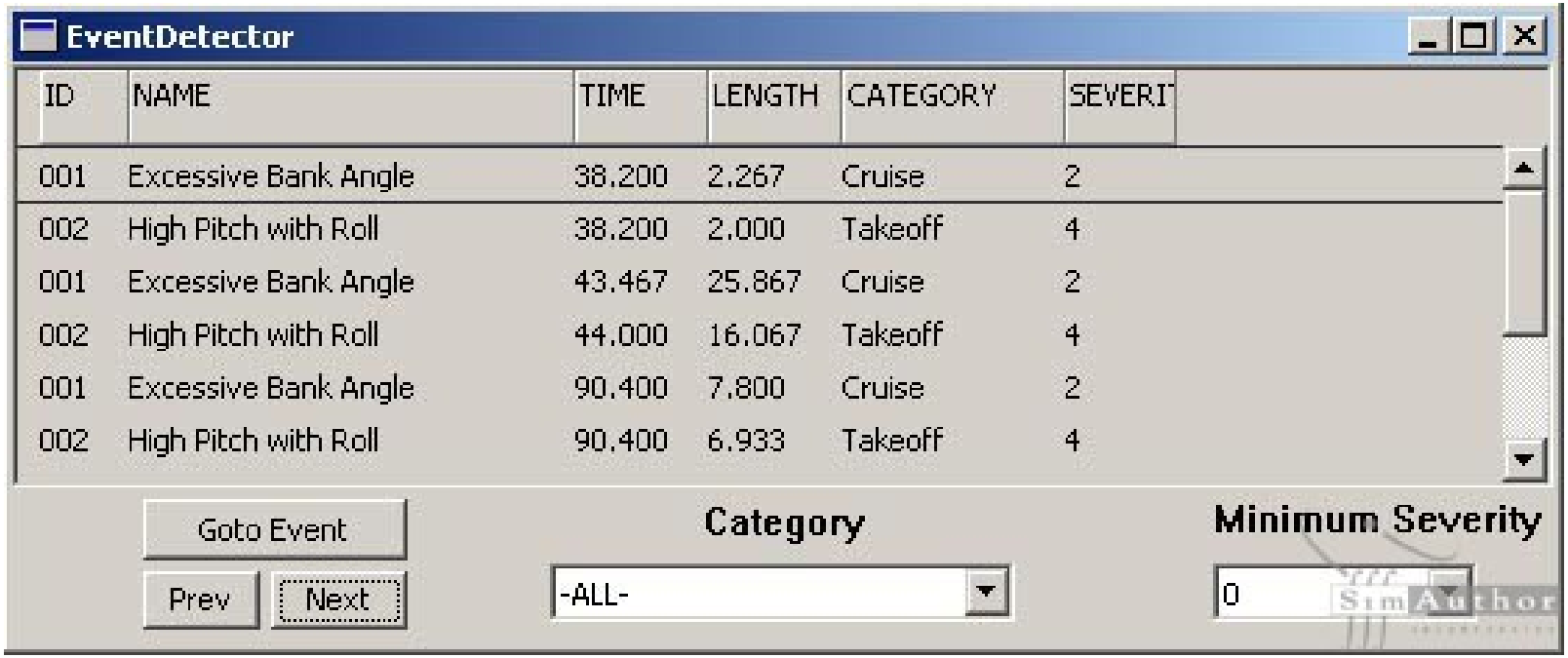
Trend Analysis and Data sharing


FlightViz 4.5.2
File Edit Tools View Groups Capture Window Help
Environment3D
NavChart - KNHK - 50 MILES AROUND KNHK (GeoRef)
EventDetector
ID NAME TIME LENGTH PHASE CATEGORY SEVERITY
1 Flaps Set 0.400 6.800 Before Takeoff Normal 0
1 Flaps Set 7.300 20.100 Before Takeoff Normal 0
17 Single Engine Landing Config. 27.500 2.400 Approach Emergency 0
17 Single Engine Landing Config. 30.000 0.100 Approach Emergency 0
17 Single Engine Landing Config. 30.200 0.600 Approach Emergency 0
Goto Event
Prev
Next
Category
Generate Report
Append
-ALL-
f18inst.dwb
Views: SkyCamera-Back
Graph2D
TIME
True_Airspeed
TEMP
ATTpitch
ATTroll
ALTcrs
ALTfine
ALTradar
HDG
CTLlong
CTLlat
CTLrudder_force
AOAlocal
AOAtrue
VS
ACCvert_2
ATTpitch_rate
ATTroll_rate
ATTyaw_rate
ACCnormal
ACCvert
ENGpla_left
ENGpla_right
CTLtef_lt
CTLtef_rt
ALTcrs
35792.80078
True_Airspeed
410.412506
CTLrudder_for
-0.653125
ENGpla_left
55.139282
ENGpla_right
57.116821
Time: 00:54:40.30
Speed: 1X
Start Time: 00:54:39.73
End Time: 00:56:24.28
Loop

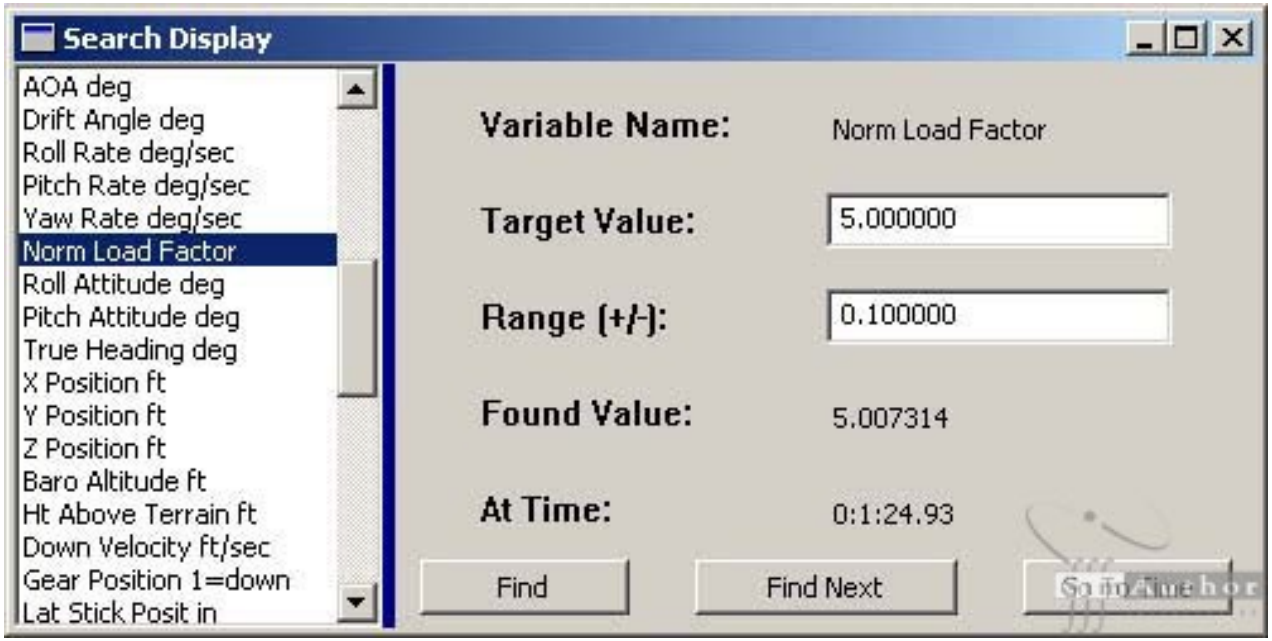
Graphical Display



Event/Threshold Detection



Searchable Parameters



MFOQA Enhancements to Automated Maintenance Programs

MFOQA

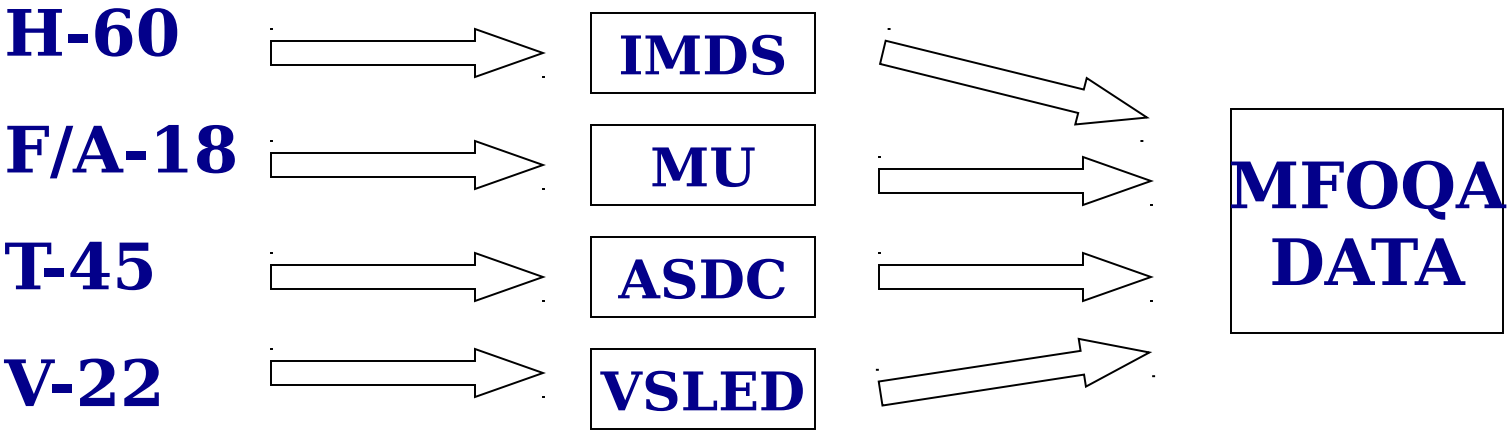
- Routine post-mission debrief
- Integrated system for maint, ops, training, safety analysis
- User friendly, PC / laptop compatible
- Aggregate trending capability
- Potential to share info with other operational organizations

Maint. Program

- Debrief maint events as required
- Maintenance/ logistics focused
- Primary use by trained maintenance personnel
- Limited trending capability
- Data used primarily by NAVAIR/OEM

MFOQA can improve pilot / maintainer communications by identifying the role the crew played in a given maint event.

DON MFOQA Platform Data Sources



IMDS: Integrated Mechanical Diagnostic System

MU: Maintenance Unit

ASDC: Advanced Signal Data Computer

VSLED: Vibration, Structural Life, Engine Diagnostic

MFOQA and Automated Maintenance Programs

- **Maintenance Programs Can identify and report a maint event to maint personnel.**
- **MFOQA has the potential to:**
  - **Provide analysis, awareness and clarity for correction.**
  - **Identify the role the crew played in the event and helps develop corrective actions required.**
  - **Provide trend analysis to explain root causes for the event.**
  - **Match a maintenance event with a specific flight profile.**
  - **Provide an easily understood and user friendly avenue to share information throughout the squadron and community.**
  - **Facilitates self correction by aircrew.**

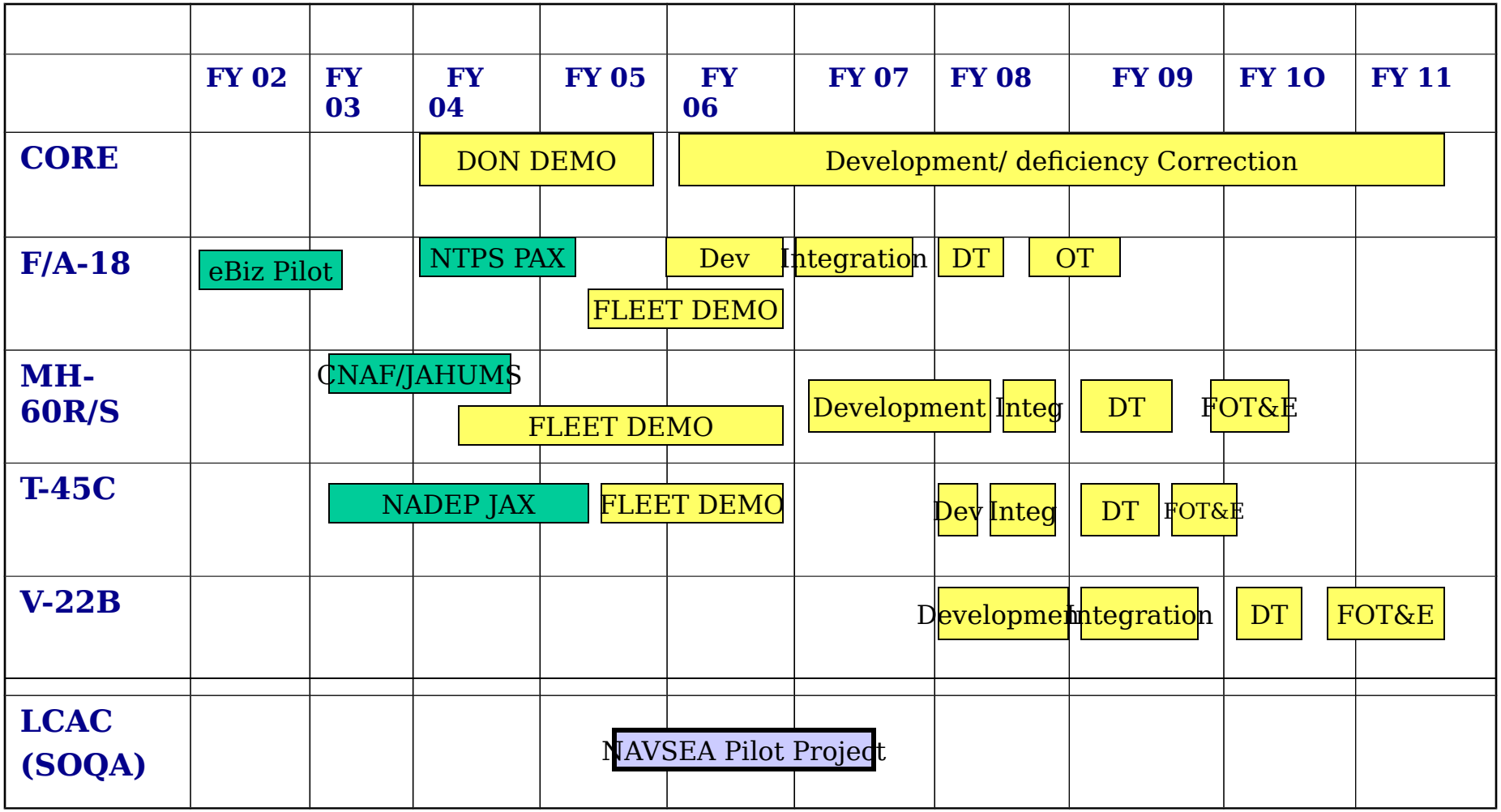
MFOQA is NOT

- Designed to ID/Punish Wrong Doers
- Designed to Punish for Honest Mistakes
- Another “Black Box” or Recorder to fit on an already heavy ACFT
- Designed to Compete With or Substitute for Existing Maintenance and IMD Recorders, FDRs, Mission Computers or HUD Tapes
- Designed to record only what we do wrong
- Reactive

DON MFOQA DEMONSTRATION PROJCET

- 2 YR Demo, started FY05
- No aircraft hardware additions
- Build upon previous work
- H-60 and F/A-18 currently in progress

DON MFOQA Demos and Implementation Plan



FUNDED (COMPLETE)

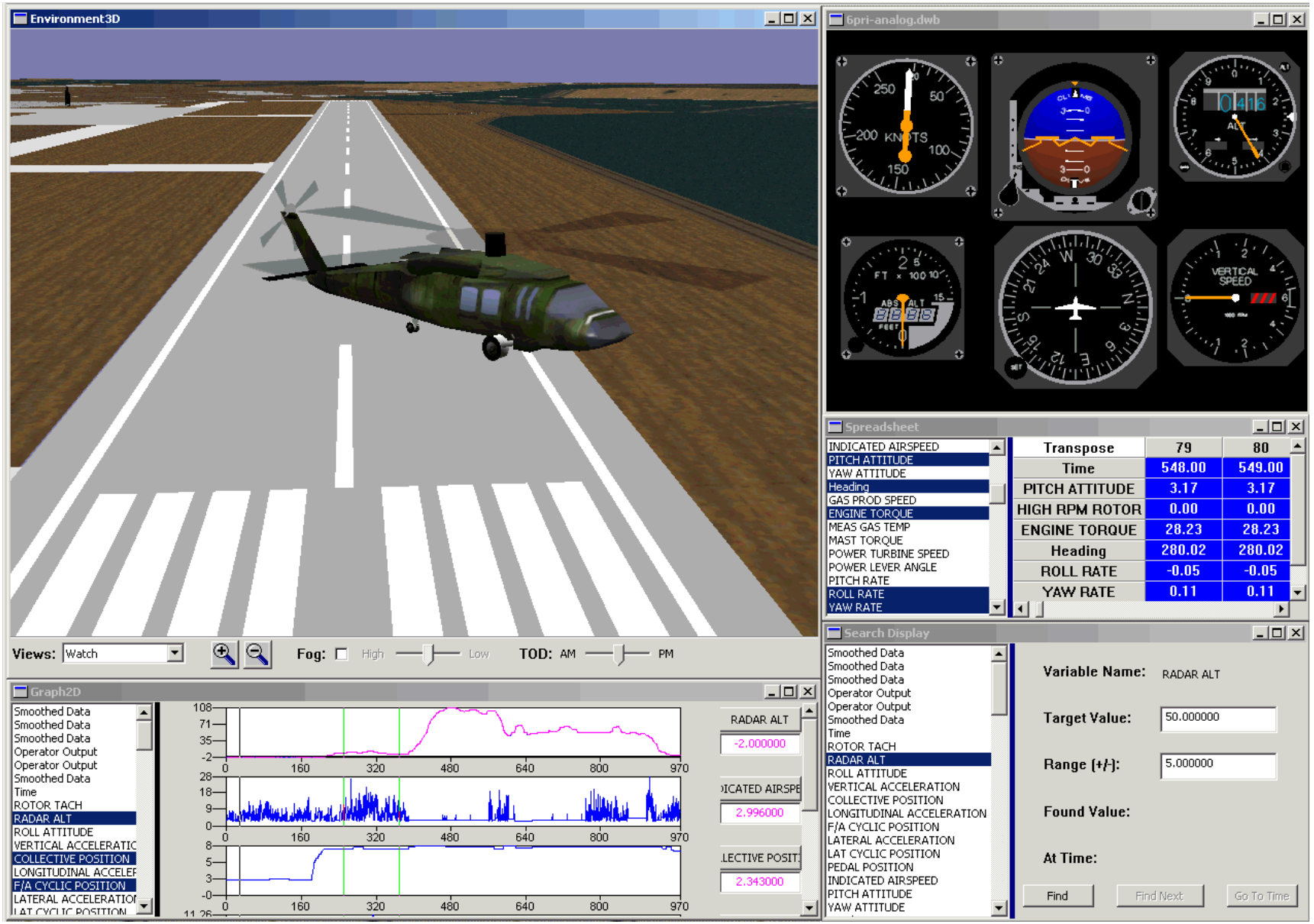
FUNDED MFOQA DEMOS AND IMPLEMENTAION PLAN

UNFUNDED/ UNDER DEVELOPMENT

HSL-41 Demo

- 4 IMDS SH-60B
- 1553 Bus Data
- Vibration, track and balance sensors
- Electronic Debriefing Capability
- Automated Summary Reports
- Funded for MH-60 R&S, 53E

Electronic Debrief



MDAT Mechanical Diagnostics

File Configuration SQL Filters Utilities Help

Aircraft: SH-60B

SN\BuNo\TailNo: 111111, 161563, 162102, 164176, 164461

Capture Window: Ground, Hover IGE, Hover OGE, Level Flight 035-070 kts, Level Flight 070-114 kts, Level Flight 114-130 kts, Level Flight 130-146 kts, Level Flight VH, Undetermined

Select Type: Indexer, Accel, Shaft, Gear, Bearing

ReQuery

Component: Disconnect Coupling, IGB Input Shaft, IGB Output Shaft, Lube Pump Shaft, Main Rotor Shaft, Outer Shaft, Planet Carrier Shaft, Port Eng Power Shaft, Port Engine Input Shaft

Sensor: PortInput, PortMain

Torque: -1 110 MR Speed: -1 110 Airspeed: -1 200

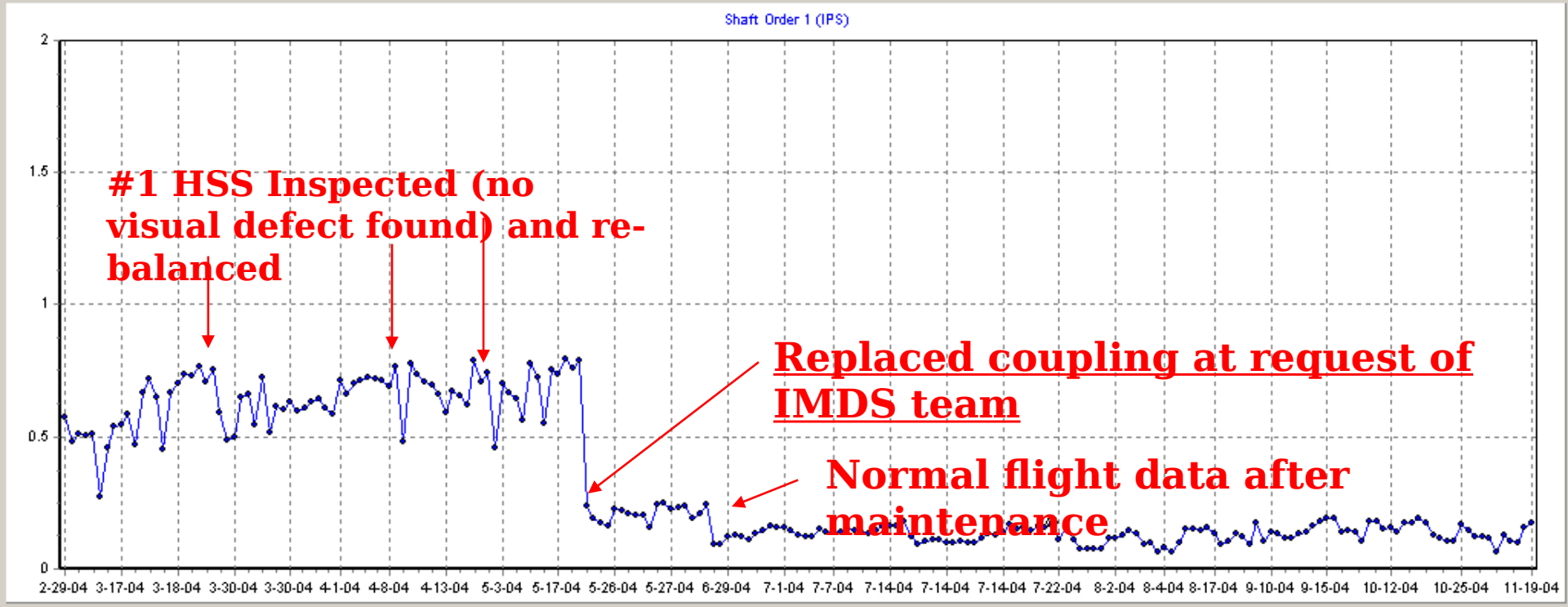
(From) 2 /16/2004 (To) 12/ 6 /2004

X Axis: Sequential, Ordered by Time

Hold All Make Plot

Prev Next

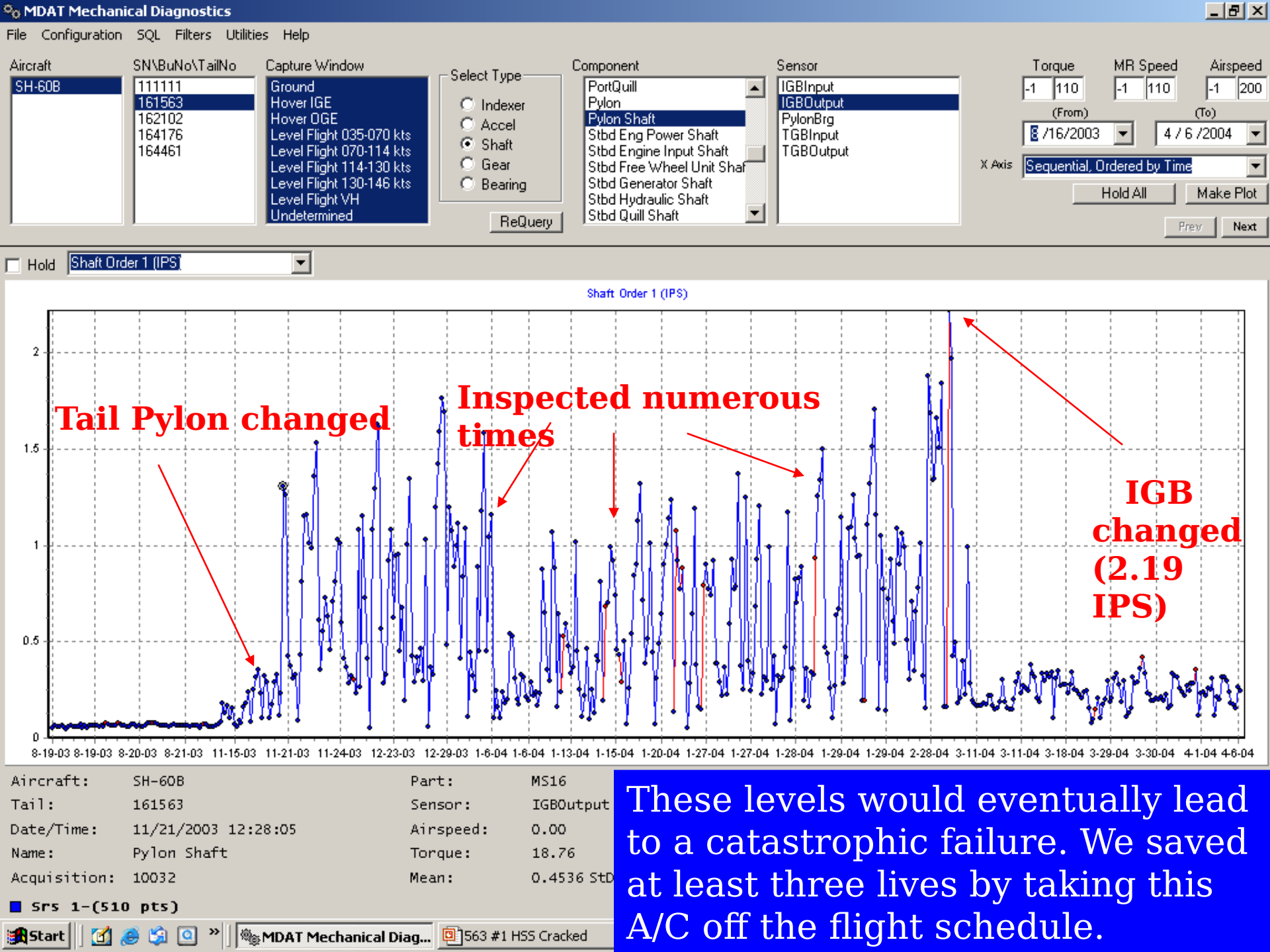
Hold Shaft Order 1 (IPS)



Aircraft:	SH-60B	Part:	MS19	MR Speed:	99.87
Tail:	161563	Sensor:	PortInput	Health:	0.50
Date/Time:	7/16/2004 11:43:42	Airspeed:	119.73	DQ:	Pass
Name:	Port Eng Power Shaft	Torque:	64.93	Regime:	Level Flight 114-130 kts
Acquisition:	10033	Mean:	0.4738 StDev: 0.1603	Data Value:	0.1764

Srs 1-(209 pts)

Start MDAT Mechanical Diag... Microsoft PowerPoint - [P... 10:26



These levels would eventually lead to a catastrophic failure. We saved at least three lives by taking this A/C off the flight schedule.

MDAT Mechanical Diagnostics

File Configuration SQL Filters Utilities Help

164461 Port Generator

Aircraft: SH-60B

SN\BuNo\TailNo: 111111, 161563, 162102, 164176, 164461

Capture Window: Ground, Hover IGE, Level Flight 035-070 kts, Level Flight 070-114 kts, Level Flight 114-130 kts, Level Flight 130-148 kts, Undetermined

Select Type: Indexer, Accel, Shaft, Gear, Bearing

ReQuery

Component: Port Free Wheel Unit Shaft, Port Generator Shaft, Port Hydraulic Shaft, Port Quill Shaft, PortFreeWheel, PortGen, PortHyd, PortInput, PortQuill

Sensor: PortAcc, PortInput

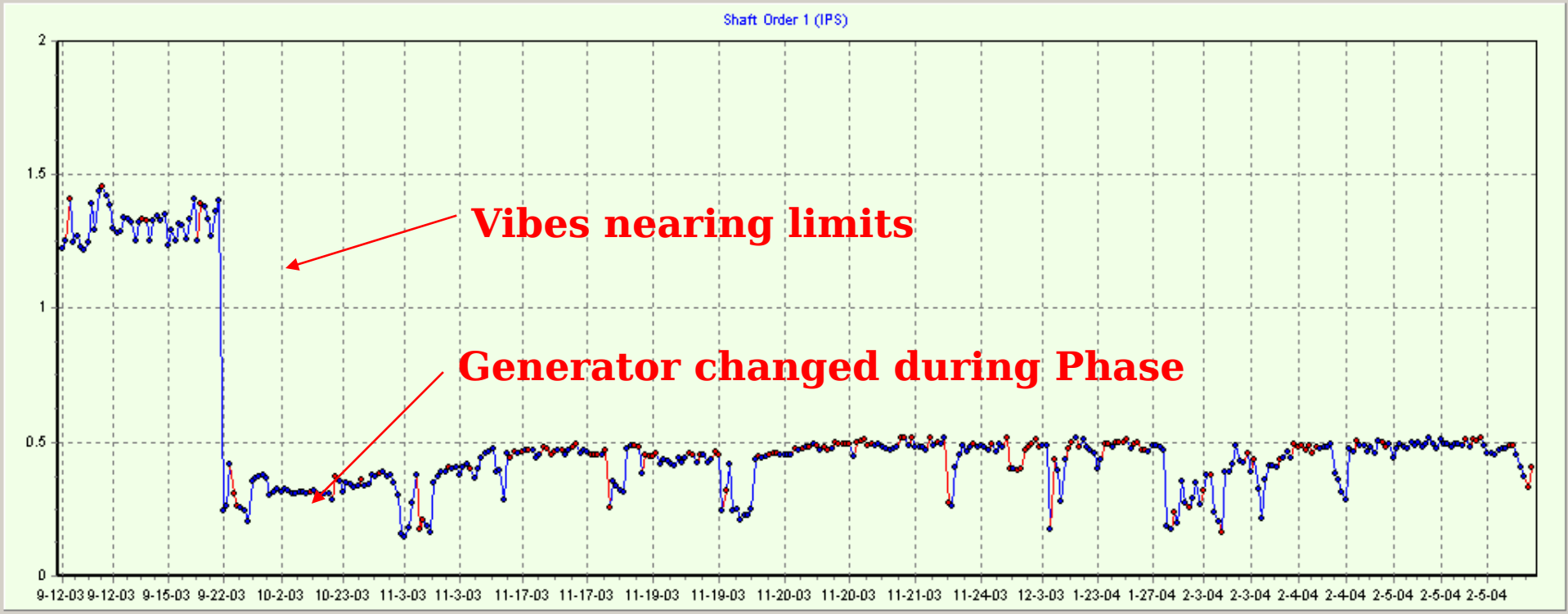
Torque: -1 110 | MR Speed: -1 110 | Airspeed: -1 200

(From) 2 / 1 /2003 (To) 4 / 6 /2004

X Axis: Sequential, Ordered by Time

Hold All | Make Plot | Prev | Next

Hold | Shaft Order 1 (IPS)



Aircraft:	SH-60B	Part:	MS04	MR Speed:	100.16
Tail:	164461	Sensor:	PortAcc	Health:	0.25
Date/Time:	10/23/2003 13:45:44	Airspeed:	94.80	DQ:	Fail
Name:	PortGen	Torque:	53.02	Regime:	Level Flight 070-114 kts
Acquisition:	10036	Mean:	0.5146 StDev: 0.2938	Data Value:	0.3731

Srs 1-(404 pts)

Start | MDAT Mechanical Diag... | 563 #1 HSS Cracked | 13:32